



3 1/2

WILLIAM S. S. S.

A. K. K. K.

SO LATED

L. E. S.

1870

1870

A Presidential Address

9.

ON

MEDICAL SCIENCE FORTY YEARS AGO :
A RETROSPECT AND A FORECAST

Delivered before the Medical Society of London on Oct. 9th, 1905

BY

SIR LAUDER BRUNTON, M.D., D.Sc. EDIN.,
LL.D. EDIN. AND ABERD., F.R.C.P. LOND., F.R.S.

CONSULTING PHYSICIAN TO ST. BARTHOLOMEW'S HOSPITAL.

Reprinted from THE LANCET, October 14, 1905.

A Presidential Address

ON

MEDICAL SCIENCE FORTY YEARS AGO: A RETROSPECT AND A FORECAST

Delivered before the Medical Society of London on Oct. 9th, 1905

BY

SIR LAUDER BRUNTON, M.D., D.Sc. EDIN.,
LL.D. EDIN. AND ABERD., F.R.C.P. LOND., F.R.S.

CONSULTING PHYSICIAN TO ST. BARTHOLOMEW'S HOSPITAL.

Reprinted from THE LANCET, October 14, 1905.

A Presidential Address

ON

MEDICAL SCIENCE FORTY YEARS AGO: A RETROSPECT AND A FORECAST.

GENTLEMEN,—The first duty I have to discharge on taking the chair here to-night is to thank you for the honour you have done me in electing me your President. The Medical Society of London is one of the oldest and most honoured of medical societies in this country and when I look at the long roll of illustrious men who have held the office of president I feel how great the honour is of having my name included in the number. I thank you gratefully for it and assure you that no effort shall be lacking on my part to maintain the dignity of the office.

My second duty is to say a few words to you in the form of a presidential address and I am glad to learn from the secretaries that it need not be a long one. This intimation is all the more agreeable to me because I have been obliged to write the address in mid-ocean on my way back from a visit with the British Association to South Africa and the falls of the Zambesi. Having no medical books I have been obliged to rely on memory and have had no opportunity of either supplying deficiencies or verifying references. I must therefore beg your indulgence if I have either made any grave omissions or inaccurate statements. It is almost exactly 39 years since I had to discharge a similar duty in taking the chair as senior president of the Royal Medical Society of Edinburgh, an old society founded in 1737 and incorporated by Royal Charter in 1778, but the active members of which consist almost entirely of medical students and young graduates. At the time of my election I had only been a graduate for a couple of months and I had just entered on my duties as resident physician to the clinical wards of the Royal Infirmary, as the great hospital of Edinburgh is called. Having no experience to look back upon my address naturally took the form of a forecast and I selected for my subject Modern Methods of Research in Medicine. I lost or mislaid the manuscript of my address many years ago but I think I laid especial stress on methods

of microscopical and chemical investigation, on the spectro-scope, clinical thermometer, and sphygmograph.

To-day I shall try again to forecast the gains of medicine from recent methods of research, but before doing so I think it may be interesting to some of the younger members of this society if I give a brief sketch of the condition of medicine at the time of which I have just spoken. For the later "sixties" and early "seventies" of the nineteenth century were a period of wonderful progress and the alterations that have occurred within less than half a century are so great as to be wellnigh incomprehensible by those who have not witnessed them. At the time of which I speak (1866) we had no antiseptis. It is true that in Professor Syme's wards we used for dressings a solution of permanganate of potash which had been recommended to him by his son-in-law, Mr. Joseph Lister (now Lord Lister). Dr. Thomas Keith was performing ovariectomies with singular success, but this success was due to the jealousy or prejudices of other surgeons who would not allow him to have patients in the hospital and obliged him to operate in a private house, where he obtained brilliant results by the exercise of singular care and scrupulous cleanliness. Had he operated in hospital I feel sure that his results would have been very different and would have justified the dictum of one of the most distinguished of the hospital surgeons: "Ovariectomy is not surgery; it is murder, and any man who does it ought to be hanged." That a wound should heal without suppuration was a rare event and from time to time a thrill of horror would go through the hospital when it was whispered that pyæmia had appeared in one of the wards. For we knew only too well how likely it was to spread and we neither knew what it was nor how to combat its progress. When it prevailed the most trivial injuries might prove fatal, and I well remember the case of a workman who, in driving a nail, had smashed the last joint of his left thumb with a hammer so that the last phalanx had to be amputated. To-day the operation would probably be done in the surgery, the thumb would be treated antiseptically, and the patient would be sent home with the certainty of recovery. Then, alas, pyæmia was prevalent and the patient died. I have heard people speak of the folly of an antiseptic spray during operations but I do not think such people could have had any idea of the condition of operating theatres when the antiseptic method was introduced. Now floors, walls, ceilings, furniture, and apparatus are clean and pure, but in those days the dust which a sunbeam striking across the operating theatre would have revealed was certain to contain numerous germs which would cause a wound to go wrong if they settled upon it.

Nor was pyæmia the only infective disease which we had to dread. Typhus fever was then rife and I think that at one time we had about 120 cases in the hospital at once. At the time I gave my address one of my fellow residents in the hospital had just recovered from typhus fever and within the

next year another of them just escaped with his life, and two more residents, as well as one of the visiting physicians, died from the disease. Yet I think it likely that many of the younger members of this society have never seen a case of typhus fever and the same is probably true of the present generation of medical students in Edinburgh. At the time of which I have been speaking there were several narrow and crowded lanes, or "closes" as they were termed, in which typhus fever was always present and from them it would every now and then spread to the neighbouring streets. But in the course of extending the University buildings the closes which formed the den of typhus fever were swept away and the disease disappeared along with them. Such an occurrence makes one think that perhaps the Great Fire of London, instead of being a great calamity, was a great blessing by clearing away infected houses and preventing a return of the plague.

Thirteen years before the date of my address Henle enunciated the doctrine that infectious diseases are due to a *contagium vivum*. In the year preceding it Davaine did his remarkable experiments on the nature and power of multiplication of the virus of anthrax and about the time it was delivered Villemin was showing phthisis to be inoculable and Chauveau and Burdon Sanderson were showing the virus of small-pox to be particulate. But we had then no definite knowledge of disease germs such as we now possess, the methods of cultivation and systematic inoculation were still in the future, aniline stains had not yet been introduced, and oil-immersion lenses, which have so greatly aided the study of disease germs, had not yet been made. Screw section-cutters had been in use in Professor Balfour's practical class of botany for several years and Mr. Stirling, Professor Goodsir's assistant, used this instrument in making preparations of animal tissues, but he kept his process more or less a secret and it was only described about five years afterwards by the late Professor Rutherford. It was then impossible to make sections of the nerve centres such as have now been made and which have thrown so much light on the course of nervous tracts in the brain and spinal cord. The only indication of cerebral localisation then known was the relationship which Broca had pointed out between lesions of the third left frontal convolution and aphasia. About three years afterwards, in the winter of 1869, my friend Professor Schmiedeberg arranged that I should go with him to see the experiments of Fritsch and Hitzig who had found that stimulation of the dog's brain near the crucial sulcus caused movements of the paws. For some reason or another, I forget what, the appointment was not kept. Their experiments went no farther and it was only in the spring of 1874 that my friend Dr. D. Ferrier, by an inspiration of genius, began to use monkeys whose brains correspond so much more closely to the human brain than do those of dogs. He was thus able to localise the functions of the

brain both sensory and motor in a way which, although it has undergone supplementation and correction, is still in the main both correct and complete.

Nor was it only our knowledge of the pathology of infective diseases which was deficient. We could not ascertain and register as we now do the extent and course of the febrile condition. The use of the clinical thermometer had just been introduced into this country by the late Professor Aitken of Netley and the clinical wards of the Royal Infirmary, being set apart specially for the instruction of University students, were provided with two of these thermometers. To the best of my knowledge these were the only two in Edinburgh, perhaps in Scotland. One was bent and the other was straight, both were between a foot and 18 inches long, and I used to walk proudly about the ward with them contained in something resembling an ordinary gun-case under my arm. But each observation required about ten minutes so that the number it was possible to make during a visit was very limited. The quickening and accuracy of action and the convenience in size produced by diminishing the bulb, adding an index, and shortening the stem have so fitted the thermometer for ready and rapid use that we have typical charts of the temperature of almost every acute disease given in our medical text-books, and the family medical man would probably feel more at ease without his stethoscope than without his clinical thermometer.

The spectroscope had shortly before been applied to the investigation of the blood and the changes produced in it by oxidation and reduction and by carbonic oxide, while my friend Professor Arthur Gamgee was engaged at that very time in studying the effect of nitrites. The hopes of great physiological, pathological, and pharmacological discoveries by the use of the spectroscope which then seemed reasonable have not yet been realised, but in other branches of science it has more than fulfilled all expectations, and it has not only given information regarding the chemical composition of this earth, of the sun, and of the stars, but it has afforded a basis for new views regarding the nature of the elements and supplies one of the best means of ascertaining the direction and rapidity of motion of the heavenly bodies. It seems, therefore, not improbable that new methods in the way of applying it to the study of the blood and tissues may increase its utility in this direction as much as the introduction of aniline stains increased the utility of the microscope in the investigation of disease germs.

Another instrument which I mentioned was the sphygmograph, with which, through the kindness of my friend, Professor Arthur Gamgee, I had become acquainted about a year before, which I had used constantly in examining the action of digitalis in myself and others, and which a few months afterwards enabled me to discover the condition of high tension present in a case of angina pectoris during the attack and thus enabled me to find a remedy.

Marey's epoch-making book on the circulation had appeared about three years previously. In it he presented in a most clear and fascinating manner solutions of many problems connected with the heart and vessels, and with it began the scientific study of the circulation in man. But the problems which this subject presents are too complicated to be solved by simple observation and they must be simplified and the effect of the various factors which compose them ascertained by experiments on animals. Such experiments were largely used for the purpose both by Marey and Chauveau but the graphic method they employed, depending as it did on transmission of pressure by air, whilst giving accurate records of changes in pressure, was ill adapted for registering its actual amount. On the other hand, this was readily done by the kymographion of Ludwig, whose introduction of the graphic method into physiology has helped its progress so greatly as almost to render it a new science. Ludwig's kymographion, consisting, as you all know, of a rod swimming on a mercurial column and registering its movements on a revolving cylinder, was invented by him about 1846, but in 1866 there was not a single instrument of the sort in Great Britain and only in the following year Burdon Sanderson constructed one with which he made his experiments on the relation between respiration and circulation. The manufacture of this instrument by the aid of a tinsmith who lived near the Middlesex Hospital marked an era in English physiology, for it was the beginning of the renaissance of physiological science in this country consequent on the general introduction of methods of research and the wide diffusion of practical instruction which were mainly due to Burdon Sanderson's exertions. Marey's book was written with wonderful clearness and was worked out so thoroughly from the mechanical side that a nervous system for coördinating the action of the heart and vessels seemed quite superfluous and one hardly noticed that the author rarely or never mentioned its existence. Ludwig, on the other hand, was deeply interested in the cardiac and vascular nervous systems and was just beginning the researches on them which have made the Leipzig school so famous. These researches were published in his "Arbeiten," the first volume of which appeared in 1867. In it he mentioned the discovery of the depressor nerve by himself and Cyon. When I first entered his laboratory in 1869, however, he had not completely formulated the relationship between blood pressure and pulse-rate, and even yet we do not know all the nervous factors which modify their relationship.

The application of new methods of experiment to the investigation of the action of drugs was just beginning. Traube had recently examined the action of digitalis on the circulation by means of Ludwig's kymographion and von Bezold had made his classic researches on the action of

atropine. Indications of a relationship between chemical constitution and physiological action had been shown to exist by the experiments of B. W. Richardson, a former president of this society, on bodies of the aliphatic series, but Crum Brown and Fraser's remarkable discovery that by changing the chemical composition of strychnine its physiological action can be altered had not yet been given to the world and consequently none of the synthetic remedies existed which are now made in such numbers and owe their origin to that discovery.

The medicines at our disposal for the treatment of disease were few in comparison with those we now have, especially in those such as are useful in the treatment of sleeplessness and the relief of pain. For example, when one of my fellow residents had typhus fever we had no remedies to combat the distressing sleeplessness except opium combined, as the fever was high, with tartar emetic, for cannabis and hyoscyamus had proved inefficient, and I well remember the anxiety with which we watched to see whether a "new remedy" for sleeplessness—viz., bromide of potassium—would produce the desired effect. Now we have chloral, sulphonal, trional, veronal, paraldehyde, and many others, but, what is even more important in such a case, we can now ascertain the temperature exactly and we can reduce it either by cold sponging or antipyretics, or both, so as to give the body a chance of acting in the way they ought to do.

We now recognise fully that a rise in temperature is not always a bad thing to be at once combated but is, on the contrary, one of nature's defences against invading microbes. But the defence may be overdone and lead to the destruction of the organism itself. One of the greatest gains in the modern treatment of febrile diseases is that we are learning when, how, and to what extent it is advisable to lower the temperature of the patient and when to leave it alone; indeed, we are now basing treatment again on a belief in the *vis medicatrix naturæ* just as our predecessors did a century ago. But there is this great difference between treatment then and now—viz., that they either left nature without help entirely or if they did meddle they muddled, whilst we are learning when and how to help nature without hindering her beneficial operations. If we review generally the progress of medicine within the last 40 years we may say that it has been chiefly in the direction (1) of discovering the part played by microbes, especially those belonging to the vegetable world, in the causation of disease; (2) of ascertaining the exact action of drugs; and (3) of making synthetic remedies. If we try to forecast its progress in the next 40 years it seems likely that further advances will be made in these three directions and in addition (4) our knowledge of animal microbes such as those which cause elephantiasis and sleeping sickness will be extended; (5) we shall learn much more about the modes of infection; (6) we shall do a great deal more to prevent infection; and (7) we shall direct our

attention more than at present to increasing the health of the organism and thus enabling it to resist disease arising either from infective microbes or disordered metabolic processes. Perhaps to these we may add yet another direction—viz., (8) increased power to discover disease germs, to treat disease, and to alter metabolism by means of new developments of electricity and forms of radio-activity. To sum up shortly, in the last half century research has been directed chiefly to the nature of invading microbes; in the next it will deal with the methods of increasing resistance. In spite of all the discoveries already made in regard to disease germs we are still ignorant of the nature of the virus of small-pox, measles, and scarlet fever in man, of horse-sickness, of catarrhal fever in sheep, of rinderpest in cattle, of heart water both in sheep and cattle, and of rabies both in man and beast. But within the last few years some great discoveries have been made which open out a new field for research regarding the causation of disease by minute animals—viz., the discovery of one protozoon as the germ of malaria, of another as that of Texas fever, of a third as that of nagana or the tsetse fly disease, and of another as the cause of sleeping sickness. Another most remarkable discovery is that elephantiasis is due to the disease of a disease germ¹ and I was much struck lately by the remark of a medical man with whom I was staying in South Africa, that some years hence the study of the diseases of disease-germs might be one of the most profitable fields of research. Carriers of infection formerly unknown have been discovered and their discovery is even now leading to the limitation or suppression of several diseases. Malaria, which is the greatest scourge of tropical countries, is now known to be chiefly, perhaps entirely, conveyed by mosquitoes and measures adapted to destroy mosquitoes and prevent their attacks have rendered districts habitable or even healthy which previously were speedily fatal to any persons who attempted to live in them. East Coast fever, Texas fever, biliary fever, and malignant jaundice, diseases which are extremely fatal to domestic animals in South Africa, have all been shown to be caused by inoculation with protozoa by the bites of ticks, and the destruction of the ticks by arsenical solutions bids fair to lessen the spread of these diseases. Nagana or the tsetse fly disease, so destructive to horses and cattle, is due to the inoculation of a worm-like protozoon by a biting fly which conveys it to domestic animals from antelopes, in whose blood it appears to be constantly present without doing them any injury. When the antelopes are destroyed the disease vanishes just as typhus fever did in Edinburgh when the infected houses were cleared away. Sleeping sickness, which is now extending so much as to threaten Africa from the Cape to Cairo, depends on a similar microbe,

¹ Vide Clifford Allbutt's *System of Medicine*, vol. ii., p. 1083.

inoculated by a fly resembling to the tsetse, but we do not yet know either how to destroy the flies or to render the reservoirs of infection corresponding to the antelopes in the other disease free from infection. For in this case these reservoirs are not animals but persons already infected and what we must hope to find is some way of destroying the fly or of discovering some drug which will act on the infecting protozoon in the same manner as quinine does on malaria. One of the chief difficulties in discovering the cause of tsetse-fly disease lay in the fact that the antelopes which acted as a reservoir of infection were not themselves ill and one of the reasons why one of the cattle fevers is so readily spread is that animals may seem healthy for some time and travel far after infection. It is not long since we learned that the disease germs of diphtheria may be present in the pharynx and those of enteric fever in the urine of patients for weeks after they are apparently well, and that persons apparently well or at most suffering from a slight sore-throat may communicate diphtheria to others, sometimes in a virulent form, and that Malta fever may be conveyed by the milk of apparently healthy goats. A knowledge of these facts would enable us to lessen or to prevent the spread of these diseases if such knowledge were practically applied. But perhaps it is too much to hope that such an application will be made, at least to such diseases as only affect the life of man and do not touch his pocket. Rabies does not exist in Australia and the most stringent quarantine is enforced because if the disease were to affect the huge flocks of sheep in that country an immense pecuniary loss would result. But in this country rabies has only been stamped out with great difficulty because many people either could not or would not see the necessity for a muzzling order which would eradicate the disease. Thorough vaccination is such an efficient preventive of small-pox that it insures almost certain immunity from infection, however virulent the type may be, and yet how many people refuse or neglect to have it performed. Pulmonary tuberculosis is the worst disease in this country, not only because of the numbers it carries off but because it seems to select as its victims those who can least be spared—the fairest, the ablest, and the best. We know its cause, we know the modes in which it is communicated, we know how its spread can be prevented, and yet the measures taken to prevent it are of such a half-hearted kind that no one can tell how long its ravages may continue, although if preventive measures were thoroughly carried out it would in less than 20 years be as rare among us as leprosy is now.

We are still in the dark as to the pathology of cancer, a disease which though claiming fewer victims is even more dreaded than pulmonary tuberculosis. Certain phenomena connected with its incidence seem to point to an infective origin but as yet no disease germ, either vegetable or animal, has been found to be its cause.

The most recent researches rather point to its being dependent on certain cells assuming a form of nutrition and growth natural to cells in the generative organs but abnormal in other parts of the body. Usually the changes which occur in an ovum and lead to its growth and development are initiated by the entrance of a spermatozoon or spermatozoid, but it has recently been found that the eggs of a sea urchin will develop without impregnation provided an extra stimulus be applied to them in a form of a strong solution of common salt. Questions likely to engage attention in the near future are (1) whether similar changes can be initiated by chemical stimuli in other cells; and (2) how far increased cell growth caused by either mechanical or chemical stimuli can be modified in nature as well as extent. Experiments on fungi and algæ have already shown that more food and more favourable conditions tend to cause asexual development, while less food and bad conditions tend to cause sexual development, a condition which, as I have already said, appears to exist in cancer cells. The thickening of the epidermis on the palm of the hand which occurs after manual labour shows how readily cell growth is stimulated by mechanical means and the rapid growth which occurs in young cretins after the administration of thyroid extract shows how powerful is the action of certain chemicals. On the life and growth of cells depend the life and health of the organism which they compose and on our knowledge of the laws which govern cell life will depend our power to prevent or to cure disease and to prolong life. We are beginning to know a little about the ferments by which cells carry on their own nutrition and influence that of others, of the effect of the waste products and toxins they form, and of the means by which their production may be lessened or they may be removed or antagonised. But much still remains to be done, especially in the way of recognising morbid changes in the organism in their early, or so-called "functional," conditions before they have resulted in those gross alterations to which we give the name of "structural." Especially may we hope that with increased knowledge of cell life we may be able by diet, drugs, and regimen so to influence the cells of the heart and vessels that they will continue to retain their healthy condition for a much longer time than they do at present. Thus life will not only be much extended beyond the present limit but the tissues being under favourable conditions of nutrition their cells will not tend to undergo abnormal sexual development and give rise to malignant growths which are at present amongst the accompaniments and terrors of increasing age. The treatment of cancer by radium emanations appears to hold out some hopes of success, but further observations are required in order to prove whether these hopes are well founded or not.

